Montana State Library
3 0864 1004 1020 1

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana

Project No. F-12-R-18 Title Western Montana Fishery Study

Job. No. I-a Title Inventory of Waters of the Project Area

Period covered July 1, 1971 to June 30, 1972

ABSTRACT

Fish population estimates on Rock Creek showed rainbow and brown trout equally abundant near the mouth while at a station nearly 15 miles upstream a predominately rainbow and Dolly Varden trout population was found. Whitefish was the dominant game-fish species at the upstream station. A combination of trout and whitefish estimates at the upstream station found 625 gamefish per 1000 feet of stream. A 24-hour oxygen sag showed Rock Creek having a favorable influence on the percent of oxygen saturation in the Clark Fork River. Eight fish were captured in the section of the Clark Fork below the Warm Springs settling ponds. Previous sampling in 1967 and 1969 found no fish in this area. Winter dissolved O_2 determinations at Georgetown Lake showed a high reading of 8.0 ppm three feet below the surface at four stations in March, 1972. The highest reading occurring below 8 feet was 2.4 ppm.

Several other fish population estimates on streams and gill netting surveys on lakes are presented and management recommendations made.

CONTENTS

This report contains results of lake and stream surveys on the following waters:

Lakes	Lakes	Streams
Alva	Painted Rocks	Rock Creek
Bearmouth Access Pond	Placid	Wyman Creek
Big Pozega	Rainy	Alder Creek
Browns	Salmon	West Fork Rock Creek
Clearwater	Shadow	Clark Fork River
Fish	Snow	Morrell Creek
Georgetown	Spud	Cottonwood Creek
Green	Stewart	Dog Creek
Inez	Unnamed T3N R17W S5&6	
Legend	Upper Twin	
Lower Twin	Upsata	

BACKGROUND

Land-use activity and land-use planning are words used frequently in the new environmental awareness era. Basic inventories of our fisheries resources are necessary to make sound land management decisions on various activities. General surveys have been conducted in western Montana since 1957 and will continue until basic data has been obtained on all waters in the district. Much of the previously gathered information has proved invaluable in providing for protection and recognition of our aquatic resources.

OBJECTIVES

The objectives of this study are:

(1) To obtain physical, chemical, and biological information on waters in the study area.

(2) To obtain information which will aid in developing fishery management plans for the various waters surveyed.

(3) To determine where additional surveillance or surveys may be necessary.

PROCEDURES

Standard D. C. electrofishing equipment was used to sample fish populations in streams. Electrofishing gear was contained in a boat utilizing a mobile positive electrode. Where population estimates were desired, the Petersen mark and recapture technique was employed. Population estimates were computed using Chapman's modification of the Petersen estimator (formula 3.9, Ricker, 1958). Confidence intervals at the 95 percent level were computed using formula 6 of the Michigan Institute for Fisheries Research (1960). The arithmetic was done by computer. Where sample sizes necessitated the capture of more fish, multiple mark and/or recapture runs were used.

Trout ages were determined through scale analyses or by length frequency determinations.

Standard experimental gill nets were used to sample lake and pond fisheries.

Abbreviations for fish species in this report are:

Rb - rainbow trout, *Salmo gairdneri* Richardson
Ct - cutthroat trout, *Salmo clarki* Richardson
WSCt - Westslope cutthroat trout, *Salmo clarki* Richardson
DV - Dolly Varden, *Salvelinus malma* (Walbaum)
Eb - brook trout, *Salvelinus fontinalis* (Mitchill)
Gr - Artic grayling, *Thymallus arcticus*
LL - brown trout, *Salmo trutta* Linnaeus
SS - coho salmon, *Oncorhynchus kisutch* (Walbaum)

KOK - Kokanee, Oncorhynchus nerka (Walbaum)
Wf - mountain whitefish, Prosopium williamsoni (Girard)
F Su - longnose sucker, Catostomus catostomus (Forster)
C Su - largescale sucker, Catostomus macrocheilus Girard
PS - pumpkinseed, Lepomis gibbosus (Linnaeus)
SQ - northern squawfish, Ptychocheilus oregonensis (Richardson)
RSS - redside shiner, Richardsonius balteatus (Richardson)
YP - yellow perch, Perca flavescens (Mitchill)
CRC - peamouth, Mylocheilus caurinus (Richardson)
LMB - largemouth bass, Micropterus salmoides (Lacepeda)

FINDINGS

STREAMS

Rock Creek Drainage

Rock Creek

Two sections on Rock Creek were sampled during September, 1971, and April, 1972. The sections were named Valley-Moon (7800 feet), located 2 miles above the mouth, and Fish and Game (6700 feet) approximately 13 miles upstream along the Montana Fish and Game Access Area. A single mark and single recapture run was made on each section during the September sampling as this was the first time fish population estimates were attempted on Rock Creek.

Fish and Game Section

Yearling and older rainbow trout totaled 179 per 1000 feet of stream (Table 1) and were the dominant trout species in the section. Dolly Varden comprised nearly 15 percent of the total trout sampled but only two recaptures were taken, making an unbiased population estimate impossible. Brown trout and brook trout were also captured but only sparse populations exist in this area. Many mountain whitefish were encountered but because of the numbers involved were not sampled to determine population size.

Table 1. Population estimates showing number and weight of yearling and older rainbow trout in the Fish and Game Section on Rock Creek in September, 1971. (95% Confidence intervals in parentheses)

Size Interval (inches)	Number per 1000 feet	pounds per 1000 feet
4.0 - 11.9	148	45
12.0 - 17.9	31	38
Total	179 (±80)	83 (±33)

During April, 1972, two marking and two recapture runs were made on the Fish and Game section of Rock Creek.

Rainbow trout populations remained comparable to those found during the previous fall sampling (Table 2). Estimates of Dolly Varden showed they comprised approximately 20 percent of the trout population. Dolly Varden over two pounds were not encountered during this sampling period while two over four pounds were captured in the previous fall sampling.

Spring, 1972, electrofishing averaged 98 trout per run while fall, 1971 runs averaged 171. Sampling during the spring was more difficult due to an increase in water flows because of an early spring runoff.

Table 2. Population estimates showing number and weight of two year old and older rainbow and Dolly Varden trout in the Fish and Game section on Rock Creek, April, 1972

Species	Size range (inches)	Number per 1000 feet	Pounds per 1000 feet
Rainbow	4.5-11.9	148	45
	12.0-18.5	25	33
Total rainbow		173 (±89)	78 (±30)
Dolly Varden	5.5-11.9	41	10
	12.0-21.9	9	9
Total Dolly Varden		50 (±34)	19 (±10)
Total Trout		223	97

Mountain whitefish estimates showed over 400 per 1000 feet of stream with a majority of the fish in the 9.0 to 11.9 inch size interval (Table 3). The total game fish population in this section was over 625 fish per 1000 feet.

Table 3. Population estimates of mountain whitefish in four size intervals from the Fish and Game section on Rock Creek, April, 1972

Size range (inches)	Number per 1000 feet	Pounds per 1000 feet	Condition factors
6.0 - 8.9	86	14	29.3
9.0 -11.9	279	96	29.7
12.0 -14.9	29	22	33.2
15.0 -19.9	10	18	38.3
Total	404 (±88)	150 (±24)	

A comparison of rainbow trout condition factors is shown in Table 4. There was a decrease in the condition of trout under 12 inches from September to April while little change is shown on those over 12 inches. Generally, fish decline in condition during winter periods.

Table 4. Condition factors of rainbow trout in the Fish and Game Section of Rock Creek in September, 1971 and April, 1972

Size range	September, 1971	April, 1972
4.0 - 11.9	41.8	36.3
12.0+	41.4	41.2

Valley-Moon Section

Brown trout and rainbow trout dominated the trout population in the Valley-Moon section (Table 5). Little difference was shown in the numerical estimates, 93 and 99 per 1000 feet for yearling and older rainbow and brown trout, respectively, although considerable difference occurred in the estimated weight with brown trout more than doubling that of the rainbow.

Table 5. Population estimates showing number and weight per 1000 feet of yearling and older rainbow and brown trout in the Valley-Moon Section on Rock Creek, September, 1971

Species	Size range (inches)	Number per 1000 feet	Pounds per 1000 feet
Brown trout	5.0- 7.4	23	3
	7.5-11.9	37	13
	12.0-23.9	39	58
Total Brown Trout		99 (±31)	74 (±25)
Rainbow trout	4.0-18.9	93 (±73)	31 (±25)

Brown trout were estimated in three size groups. It was apparent that an unusually large number of trout were in the adult size groups (7.5 to 23.9 inches). This large number of adults may result from a spawning migration into Rock Creek from the Clark Fork River or a poor year class of yearlings. Tagging studies should be initiated to provide information on spawning movement in the future. Only four Dolly Varden were captured in this section. Brook trout were present but not abundant. Mountain whitefish over four pounds were recorded, but due to the large number in the section were not sampled for population estimation. Many largescale suckers were also encountered, which was in sharp contrast to the upstream section where very few suckers were found.

High-water caused considerable difficulty during spring sampling on the Valley-Moon section. With two marking and two recapture runs, estimates on only the brown trout population were possible. Only two recaptures precluded unbiased estimation of the rainbow trout population.

Although confidence intervals overlapped showing no statistical population differences, the point estimate indicated a considerable reduction in brown trout numbers from 99 to 64 per 1000 feet (Table 5 and 6). This may be a result of low natural mortality or possible spawning movement.

Table 6. Brown trout population estimates showing number and weight per 1000 feet during April, 1972 sampling (95% confidence interval in parentheses)

Size range (inches)	Number per 1000 feet	pounds per 1000 feet
5.5-23.9	64 (±33)	61 (±31)

The brown trout average nearly one pound each. Condition factors show a slight decrease (Table 7) between September and April sampling.

Table 7. Condition factors of brown trout in the Valley-Moon section of Rock Creek in September, 1971 and April, 1972

Size range	September, 1971	April, 1972
5.0 - 23.9	38.3	36.6

Dolly Varden were not captured in this section during spring sampling and only four were captured during September sampling. The lack of Dolly Varden would indicate that they may be effectively out-competed by the brown trout or the habitat conditions in this area are not adequate for Dolly Varden survival. As brown trout move into the upper reaches of Rock Creek, trend information on Dolly Varden populations should be gathered. If competition is depressing the Dolly Varden, consideration should be given to eliminating brown trout in areas where Dolly Varden are the desired species.

Rock Creek Oxygen Sag

A single twenty-four hour oxygen sag was run to determine the effects of Rock Creek on the Clark Fork River. The Rock Creek station was located approximately 1 mile above the mouth. One station on the Clark Fork River was located upstream from the mouth of Rock Creek and the other approximately four miles downstream at the Schwartz Creek bridge.

Samples were taken at 4-hour intervals. The results of the sampling are presented showing the parts per million dissolved oxygen concentrations (Figure 1) and the percent oxygen saturation (Figure 2). Rock Creek had the definite beneficial effect during the early morning hours of increasing the oxygen content in the Clark Fork River. Considerable algal growth appears to be the primary factor influencing the lower dissolved oxygen readings on the Clark Fork. Additional nutrient increases combined with low water flows and higher temperatures could cause critical oxygen deficiencies in the Clark Fork.

Wyman Creek

A 300-foot section was sampled near the mouth of Wyman Creek in April to obtain information on the various species present (Table 8). Dolly Varden was the dominant species followed by rainbow trout.

Alder Creek

A 300-foot section was sampled near the mouth of Alder Creek in April. Alder Creek sampling showed a preponderance of young Dolly Varden (Table 8). Five rainbow trout were captured, three were ripe males, with two being gravid females. A redd was observed in one area. Alder Creek is obviously a spawning stream for rainbow trout and Dolly Varden.

West Fork of Rock Creek

A 300-foot section was sampled near the West Fork Work Center. Dolly Varden, cutthroat, brook trout, and whitefish were captured (Table 8). Electrofishing efficiency was low as many trout were hit by the current but escaped capture.

Table 8. Summary of fish captured during spring, 1971 sampling in Wyman Creek, Alder Creek, and the West Fork of Rock Creek

Stream	Section Length	Species	No.	Range (inches)
Wyman Creek	300 feet	WSCt	1	9.2
		Dv	7	3.2 - 5.0
		Eb	3	4.1 - 7.5
		Rb	5	4.6 - 6.5
Alder Creek	300 feet	Ct	6	4.2 - 7.1
		Rb	8	4.7 -15.1
		Dv	30	2.2 - 6.1
		RbxCt	8	3.2 - 5.0
		Eb	1	7.5
West Fork Rock Creek	300 feet	Dv	3	5.5 -10.4
		Ct	11	3.8 -10.8
		Eb	1	13.6
		Wf	7	3.1 -12.5

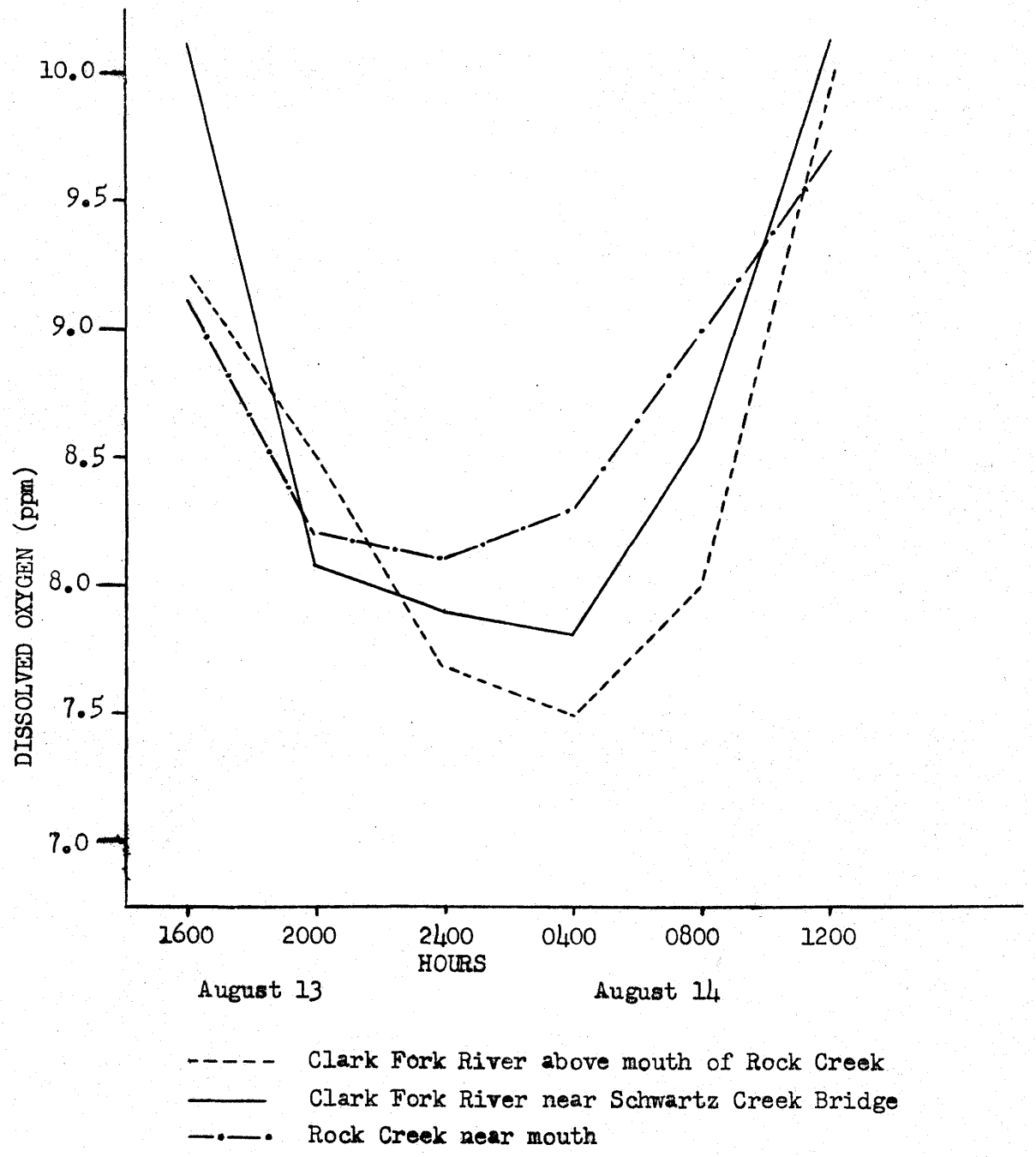

Figure 1. The influence of Rock Creek on a 24-hour oxygen sag in the Clark Fork River.

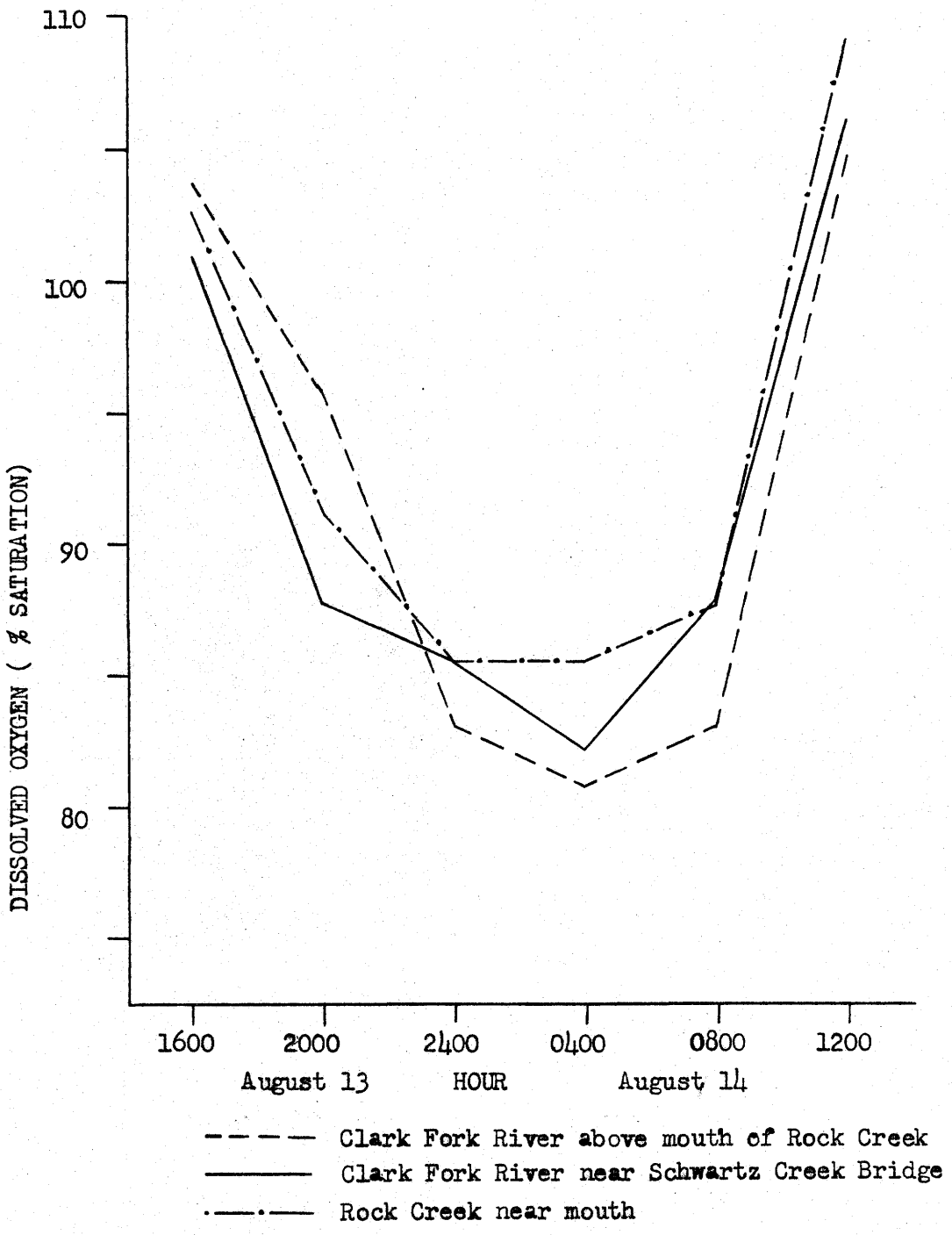

Figure 2. The influence of Rock Creek on a 24-hour oxygen sag (% saturation) in the Clark Fork River.

Clark Fork River

In past years, fish population study sections located below the Anaconda Company settling ponds at Warm Springs have been under surveillance. High heavy metals (Cu, Zn, Pb) concentrations have occurred below the settling ponds (see Water Quality Study of the Upper Clark Fork River and Selected Tributaries, 1972) and past operations have introduced considerable tailings into the Clark Fork River. In October of 1972, a closed-system was to go into operation in Butte which is designed to eliminate this pollution.

Surveillance of the fish populations in the area below the Warm Springs settling ponds was conducted in April, 1972 to provide additional background information prior to this new system coming into operation.. These populations are compared below with estimates obtained in August, 1969.

Williams-Tavenner Section

The first comparison is on the Williams-Tavenner section which is 1.1 mile in length. A single marking and single recapture run was the basis for this estimate.

The primary species captured were brown trout and mountain whitefish (Table 9). Longnose and white suckers were also taken but no estimates made because of an extremely low recapture rate. Redside shiners were also abundant.

Table 9. Brown trout population estimates and 95% confidence intervals from the Williams-Tavenner section on August, 1969 and April, 1972

Date	Length range	M 1/	C 2/	R 3/	Point Estimate	95% C.I.	80% C.I.
August 1969	3.3 - 20.9	38	113	7	542	±348	±223
April 1972	4.0 - 11.9	18	25	5	82		
	12.0 - 18.5	21	21	7	61		
		39	46	12	143	±63	±40

1/ Total number in marking run
2/ Total number captured in second run
3/ Total number of recaptures

Table 10. Whitefish population estimates and 95% Confidence Intervals from the Williams-Tavenner section on August, 1969 and April, 1972

	Length range	M[1]	C[2]	R[3]	Point estimate	95% C.I.
August, 1969	7.2 - 16.3	67	103	4	1751	± 1396
April, 1972[4]	7.5 - 11.9	116	54	3	2895	± 1529
	12.0 - 16.5	147	112	12		
		263	166	15		

1/M- Total number in marking run
2/C- Total number captured in second run
3/R- Total number of recaptures
4/ - One marking, two recapture runs

The brown trout population appears considerably smaller in 1972 than in 1969, although at the 95% confidence level there is no significant difference in the trout population. However, comparing populations utilizing 80% confidence limits there is a significant difference. The high number of trout over 12.0 inches, 61 versus 82 under 12.0 inches, would indicate that spawning success may be limiting or else our sampling techniques are extremely inefficient for trout in the younger age groups. Intragravel surveillance should be carried out in this area to determine the conditions available for spawning.

The number of whitefish estimated in 1969 was 1751 versus 2895 during 1972 (Table 10). Again the overlap in confidence intervals indicates no significant difference in the population size.

Racetrack Creek Section

This section begins at the county bridge above Racetrack Creek to the west country bridge downstream on Hares Greenhouse Road. The section is 5.4 miles in length. A single marking and single recapture run was made. A comparison is shown with a single run in August, 1969 (Table 11).

Table 11. Number and size of fish captured in the Racetrack Creek section in August, 1969 and April, 1972

Date	Species	Number	Length Range	Length Average
August, 1969	LL	124	2.8-21.6	10.9
	Eb	2	6.9- 8.3	7.6
	CtxRb	1	10.6	10.6
	RSS	59	-	-
	FSu	6	-	-
April, 1972				
Run 1	LL	11	4.1-25.6	11.7
	Eb	2	5.5-10.6	8.1
	Wf	49	4.5-14.1	10.8
Run 2	LL	31	3.7-17.4	11.6
	Eb	1	6.1	-
	Wf	67	8.8-15.4	12.2
	FSu	1	6.9	-

Assuming the efficiency of sampling to be comparable, there is a decrease in the number of trout between years. Of interest is the occurrence of whitefish in 1972 while none were taken in 1969. Low sampling efficiencies were obvious as no recaptures were taken on the second run in April, 1972, although 62 fish were marked. Due to the length of this section and the low numbers of fish captured, it is recommended that this sampling station be dropped in favor of more intensive surveillance of fish populations, in the pH shack section.

pH Shack Section

This section begins at the county bridge near the Anaconda Company pH shack near Warm Springs and extends 2.2 miles to the next county bridge. In 1969 no fish of any kind were collected in a single electrofishing run. In 1972, four brown trout, three whitefish, and one longnose sucker were captured. Additional surveillance should be planned for this section.

Man-made Meander Study

Several sections were sampled in the Clark Fork River as part of a cooperative study with the Cooperative Fisheries Unit and Engineering Department at Montana State University to evaluate man-made meanders and their effects on the stream and its fish populations. A report summarizing the fish population data gathered will be available early in 1973.

Paradise Cut-off Gill Net Survey

Three overnight experimental 125-foot gill nets were set in the Clark Fork River above the mouth of the Flathead River in the Paradise cut-off area. One net became completely clogged with detritus, primarily algae, and was ineffective. The number and average length and weight of each species is shown in Table 12.

Table 12. The number and average length and weight of each species captured in two overnight gill net sets on the Clark Fork River

	Species					
	Rb	Dv	Wf	CSu	CRC	Sq
Number	3	1	5	6	2	26
Average length	14.8	11.5	14.5	11.0	10.9	10.6
Length range	13.4-15.6	-	12.7-15.3	7.2-13.9	10.2-11.6	7.7-15.6

Non-game species, primarily squawfish, dominated the catch. Because of the heavy currents, gill netting does not appear to be a satisfactory way to sample this section of the Clark Fork.

Bitterroot Drainage

Burnt Fork of the Bitterroot

Due to a proposal for a dam, a 750-foot section of the Burnt Fork was electrofished in February to determine species composition and trout population sizes in this drainage. Stream flow at the time of sampling was approximately 20 cfs. Cutthroat trout was the dominant species, comprising nearly 75 percent of the trout population, followed by brook trout and Dolly Varden (Table 13). There was some indication of hybridization of cutthroat with previously introduced rainbow trout. All trout captured were under 13.0 inches in length. The population encountered was excellent for a mountain stream of this size.

Table 13. Trout population estimates 1/ for a 750-foot section of the Burnt Fork of the Bitterroot River in February, 1972 (95% confidence interval in parentheses)

	Species		
	Cutthroat trout	Brook trout	Dolly Varden
Number	181 (±80)	63 (±40)	3 captured, no estimate made

1/ 4.5 inches and larger

Blackfoot Drainage

Morrell Creek

On November 30, 1971 a 200 foot section of Morrell Creek below the main highway bridge was electrofished to obtain information on the kokanee spawning run which originates from Salmon Lake. Mature kokanee females averaged 11.4 inches while mature males averaged 12.1 inches. What appears to be a spawning run of brown trout was noted as 6 brown trout ranging in length from 14.5 to 20.3 inches were captured. The number and average length of each species captured is shown in Table 14.

Table 14. Number and average length and weight of each species of fish captured in Morrell Creek, November, 1971

Species		Number captured	Average length	Length range (inches)
Kokanee	Male	17	12.1	11.2-13.3
Kokanee	Female	15	11.4	10.8-12.0
LL		6	15.6	11.5-20.3
Eb		6	7.4	3.9- 9.5
Ct		1	6.2	6.2
DV		1	3.3	3.3

Morrell Creek is obviously important as a spawning area for kokanee and brown trout.

Cottonwood Creek

A fish population estimate was made in Cottonwood Creek on the Blackfoot-Clearwater Game Range in August, 1971. A 2,100-foot section, beginning at the wooden bridge on the entry road near the large residence, was shocked with a boat containing electrofishing gear. One marking and one recapture run was made. The section ended at the next wooden bridge downstream behind the old buildings.

The population estimate by species and for the total is given below with their 95 percent confidence limits

Total	LL	WF	Rb	Eb	DV	Ct	CtxRb
1310±26%	787±40%	272±76%	139±45%	79±58%	16±81%	No est.	No est.

Species composition of the catch from the marking run is as follows (in percent)

LL	Wf	Rb	Eb	DV	Ct	CtxRb
48.1(127)1/	25.0(42)	16.0(43	8.6(23)	1.9(5)	0.7(2)	0.7(2)

1/ Sample size in parentheses

Width measurements of the 2100-foot section were also made. The average width of the stream was 24.4 feet. The entire section comprised 1.1 acres of water. This does not include small side channels which were not shocked. The standing crop of fish per acre was 509 pounds of all species. Number of fish per 1,000 feet equaled 624. Water temperature was 52°F at the beginning of the marking run on August 9, 1971. It was 45°F and 57°F at the beginning and end of the recapture run on August 25, 1971. There was a 16-day period between marking and recapture runs. A total of 41 cottus (probably cognatus) were also caught. Maximum length recorded was 3.6 inches. Length ranges of all fish caught in the marking run is shown below.

Species and Length (in.)

LL	Wf	Rb	Eb	DV	Ct	CtxRb
2.3-18.5 (8.5) 1/	2.3-15.5 (11.2)	3.6-15.1 (8.1)	2.4-11.4 (6.7)	5.3-22.2 (9.8)	7.5-10.0 (6.1)	5.2-7.0 (8.8)

1/Average length in parentheses

The largest fish caught was a 22.2 inch Dolly Varden weighing 2.69 pounds.

Little Blackfoot Drainage

Dog Creek

Two sections of Dog Creek were electrofished on June 17, 1971 as part of a fisheries survey to determine species distribution in the upper Little Blackfoot drainage. Several runs were made in each section. The first section (400 feet) was above the mouth of Hope Creek, in a meadow area where no overhanging vegetation occurred. Cutthroat and brown trout were the only trout species captured with the largest being under 7.0 inches long (Table 15). Longnose suckers and a single mountain whitefish were also captured.

Table 15. Fish species captured on two sections of Dog Creek during the summer of 1971

	Species			
	Ct	LL	Wf	FSu
Sec. 1 (11N 6W S18)				
Number	18	10	1	5
Length range	2.6-6.6	3.1-6.0	0.0-3.7	4.2-6.7
Average length	4.5	4.0	3.7	5.4
Sec. 2 (11N 6W S31)				
Number	9	16	34	27
Length range	4.1-9.1	3.6-13.4	4.2-11.0	3.6-9.7
Average length	6.2	8.2	8.2	6.8

Section 2 on Dog Creek was approximately four miles above the mouth. Overhanging cover was pronounced in this area. Cutthroat and brown trout were the only trout species taken. Mountain whitefish dominated the catch.

LAKES

Lakes Alva and Inez

Creel Census Surveys

Creel census surveys were made on opening day and also on Sunday, August 1 and August 8, on Lakes Alva and Inez. Census takers checked as many boat fishermen as possible. The catch rate was higher on Lake Inez than on Lake Alva, 1.7 to 1.1 game fish per hour, respectively (Table 16).

Table 16. Creel census results obtained from surveys on Lakes Alva and Inez in 1971

Lake	Date	No. fishermen checked	Total hours fished	Total caught			Catch hrs.	Average Length			Average condition factor		
				Ct	KOK	DV		Ct.	KOK	DV	Ct.	KOK	DV
Inez	6/20	13	20	26	5	2	1.7	9.9	10.0	15.3	29.4	33.0	30.6
	8/1	4	6	16	0	0	2.7	11.0	-	-	33.8	-	-
	8/8	6	6	0	3	0	0.5	0	10.4	-	-	31.3	-
	Total	23	32	42	8	2	1.7						
Alva	6/20	27	73	75	1	3	1.1	10.4	10.7	15.7	30.3	35.0	31.0
	8/1	2	2	2	-	-	1.0	10.2	-	-	38.5	-	-
	8/8	14	17	7	8	1	.9	10.7	9.0	11.6	28.7	36.6	32.0
	Total	43	92	84	9	4	1.1						

Cutthroat trout was the major species in the creel. There was little difference in the average lengths of fish taken, although condition factors were generally greater for all species on Lake Alva than Lake Inez (Table 16). The catch per hour indicates that boat fishing was good on Lakes Alva and Inez.

Gill Net Surveys

A summary of the gill net catch data from lake surveys is presented in Table 17. Comments and recommendations for each lake are as follows:

Table 17. Summary of gill net catch data from lake surveys

Lake (Code number)	Number of net sets	Percent of game fish	Species caught (number in parentheses)	Size range (inches)	Average size (inches)	Average condition factor
Alva (04-6120)	3	13.7	DV (9)	8.5-16.7	12.5	
			Ct (24)	8.5-13.1	10.0	
			KOK (1)	9.4	9.4	
			YP (28)	5.1- 8.9	7.2	
			PS (31)	3.9- 6.0	4.6	
			FSu(155)	6.9-15.8	11.5	
Bearmouth Access Pond	1	100.0	Rb (2)	17.6-20.0	18.8	
Big Pozega (06-9006)	3	100.0	Rb (26)	6.8-14.0	10.2	32.6
			Ct (25)	7.0-11.7	10.3	28.8
			RbxCt (53)	5.1-22.0	9.5	29.9
Browns (04-6210)	3	38	Rb (27)	7.7-14.4	10.3	-
			Eb (1)	0.0-11.4	11.4	-
			SS (4)	10.7-14.5	12.8	-
			FSu (51)	7.5-14.4	-	-
Clearwater (04-6300)	2	100.0	WsCt (16)	8.2-18.8	15.2	39.0
Fish (03-7850)	2	100.0	Ct (108)	6.2-10.9	8.3	-
Georgetown (06-7961)	6[1]	59.0	Rb (229)	5.5-17.9	10.9	
			Gr (16)	13.1-15.4	14.1	
			Eb (26)	6.8-16.0	10.9	
			KOK (16)	9.3-14.0	10.6	
			SS (1)	11.7	11.7	
			Ct (2)	12.9-14.7	13.8	
			FSu (202)	6.3-14.0	9.8	
Green (04-6600)	3	100	Rb (15)	6.3-17.6	12.2	41.0
			Ct (6)	8.9-17.1	12.1	36.5
			RbxCt (15)	7.4-17.2	11.4	37.6
Inez (04-6720)	3	14	Ct (9)	9.1-17.8	10.5	-
			KOK (9)	8.8- 9.7	9.3	-
			DV (2)	15.6-19.0	17.3	-
			Wf (1)	9.3	9.3	-
			YP (23)	5.5-8.0	7.3	-
			FSu (82)	7.3-13.6	10.6	-
			PS (24)	4.2- 6.1	5.0	-
Legend (03-8400)	2	100	WsCt (42)	6.1-12.1	9.5	47

Table . (cont'd)

Lake (Code Number)	Number of net sets	Percent of game fish	Species caught (number in parentheses)	Size range (inches)	Average size (inches)	Average condition factor
Lower Twin (03-9475)	1	100	Rb (15)	6.1- 7.3	6.5	-
			RbxCt (1)	6.5	6.5	-
Painted Rocks	3	31.4	HRb[1/] (4)	10.9-11.7	11.4	
			Ct (15)	6.8-11.3	9.2	
			DV (13)	7.6-13.6	10.6	
			Eb (2)	7.5- 8.4	7.8	
			FSu (59)	6.5-12.5	8.8	
			CSu (15)	7.0-13.4	10.7	
			Wf (4)	7.9- 8.3	7.9	
			RSS (9)	5.3- 6.2	5.7	
Placid (04-7140)	3	23	Eb (10)	7.1-11.8	10.4	-
			DV (6)	13.6-18.1	15.3	-
			KOK (5)	7.5-10.9	9.2	-
			RbxCt (2)	10.8-11.8	11.3	-
			Wf (13)	8.4-13.3	11.0	-
			LMB (1)	11.0	11.0	-
			FSu (20)	12.2-18.8	15.2	-
			CSu (3)	14.3-18.9	16.3	-
			PS (45)	3.5- 7.5	5.6	-
			Sq (33)	9.8-22.0	12.3	-
			CRC (17)	9.2-14.5	11.7	-
Rainy (04-7170)	2	46.7	DV (6)	14.5-26.0	21.0	-
			Ct (8)	9.6-13.8	11.7	-
			FSu (16)	8.2-13.3	9.3	-
Salmon (04-7230)	3		LL (4)	14.1-15.7	14.7	-
			DV (2)	9.9-16.8	13.4	-
			Wf (23)	8.0-13.1	11.0	-
			Sq (32)	7.3-18.2	10.5	-
			YP (22)	5.2- 9.0	7.0	-
			PS (10)	5.2- 7.0	5.9	-
			CRC (23)	8.0-13.2	10.4	-
			CSu (20)	6.3-17.4	13.1	-
			FSu (35)	8.9-16.2	13.5	-
Shadow[2/] (03-8950)	0	-	0	-	-	-
Snow (03-9100)	2	-	0	-	-	-
Spud (03-9250)	2	100	Ct (49)	6.6-11.4	9.3	39

Table . (cont'd)

Lake (Code Number)	Number of net sets	Percent of game fish	Species caught (number in parentheses)	Size range (inches)	Average size (inches)	Average condition factor
Stewart (06-9253)	2	100	Rb (13)	9.7-11.2	10.5	-
Unnamed 2/ T3N R17W S5&6 (03-9550)	0	-	0	-	-	-
Upper Twin (03-9475)	2	100	Rb (2) RbxCt (8)	9.1-10.5 7.5-15.5	9.8 11.4	- -
Upsata (04-7560)	2	100	Rb (25)	5.4-17.3	11.9	-

1/ Hatchery rainbow trout

2/ Scuba gear used to detect presence or absence of fish

Alva - Follow-up survey

This lake was surveyed to determine whether or not undesirable species have again repopulated this lake since the 1965 rehabilitation project. Previous netting in 1968 showed no pumpkinseed and many longnose suckers present. Yellow perch and pumpkinseed were present in considerable numbers during this survey. The average size of cutthroat had decreased from 12.8 inches in 1969 (Spence, 1970) to 10.0 inches in 1971.

Bearmouth Access Pond - Follow-up survey

In October, 1970, catchable (over 7 inches) rainbow trout were introduced into the Bearmouth Rest Area pond. This pond was surveyed to determine the relative abundance and size of the fish during early spring of 1972. Two rainbow were captured, the largest of which was over 4.5 pounds. It is recommended that 4 to 6 inch rainbow be planted on an alternate year schedule.

Big Pozega - Special survey

A request to raise the dam level on Big Pozega Lake initiated this survey. The lake is very deep with limited littoral zone available. Rainbow, cutthroat, and their hybrids were found in considerable numbers. Their condition factors were quite low in comparison to other lakes.

Browns - Follow-up survey

In 1967, 1968, and 1969 fingerling coho salmon were planted in Browns Lake. Coho salmon dominated the gill net catch in 1968 and 1969 but were negligible in the 1971 sampling when only 4 were captured. The average size of the rainbow in the lake has continued to decline from over 14 inches in the previous sampling (Spence, Feb. 1970, Nov. 1970) to 10.3 inches in 1971.

Clearwater - Follow-up survey

This survey was initiated to monitor the species composition and size of the trout in Clearwater Lake. In 1968, Rainbow-cutthroat hybrids were present along with Dolly Varden (Spence, Feb. 1970). During this survey in June, 1972, only Westslope cutthroat trout were captured. The condition of the trout was excellent. It appears that natural reproduction is negligible in this lake.

Fish - special survey

This lake located in the East Fork of the Bitterroot drainage was surveyed to aid Forest Service personnel in identifying the fisheries resources in the area. A considerable number of cutthroat are in this lake as indicated by over 100 trout being captured in two overnight gill net sets.

Georgetown - Special survey

Three floating and three bottom experimental overnight gill net sets were made in Georgetown Lake in July, 1971. The floating gill nets were much more selective in capturing game fish as they had 89 percent of the catch being game fish versus 35 percent for the bottom sets. The average size was less than an inch greater than averages found for each species during the 1970-71 winter creel census (Marcoux, 1970). Rainbow was the dominant game fish species.

Winter Dissolved Oxygen Measurements - Georgetown Lake

A comparison of winter dissolved oxygen measurements was made at several stations (See Figure 3) during February and March 1971 and 1972, respectively (Table 18). Both winters were severe with the winter of 1971-72 being the most severe in terms of snowfall. Dissolved oxygen readings at levels 3 feet below the ice surface during February 1971 remained at 10 ppm or greater. During March, 1972 the highest reading that occurred at the three foot level was 8 ppm. Dissolved oxygen readings at all levels were as low or lower during 1972 than 1971. It appears that additional eutrophication of Georgetown Lake combined with a severe winter could result in a winterkill.

Green - Special Survey

Green Lake lies near Big Pozega Lake in the Racetrack Creek drainage. Forest Service personnel requested this lake be surveyed as additional dam construction was being considered. Rainbow, cutthroat and hybrids were present. Their average size and excellent condition indicate an excellent self-sustaining fishery.

Inez - Follow-up survey

Three nets were set to monitor the cutthroat and kokanee populations and determine the extent non-game species had repopulated the lake. A considerable decrease in the average size of cutthroat trout occurred between 1969 and 1971 when average lengths were 15.0 and 10.5 inches, respectively. Yellow perch were taken in 1971. It is evident that non-game species are increasing. This increase is undoubtedly detrimental to the trout populations.

Legend - Special survey

This is another lake in the East Fork of the Bitterroot that was requested for survey by Forest Service personnel. This lake was planted in 1969 with Westslope cutthroat and it appears spawning is occurring in the inlet. The trout are in excellent condition as shown by a condition factor of 47.

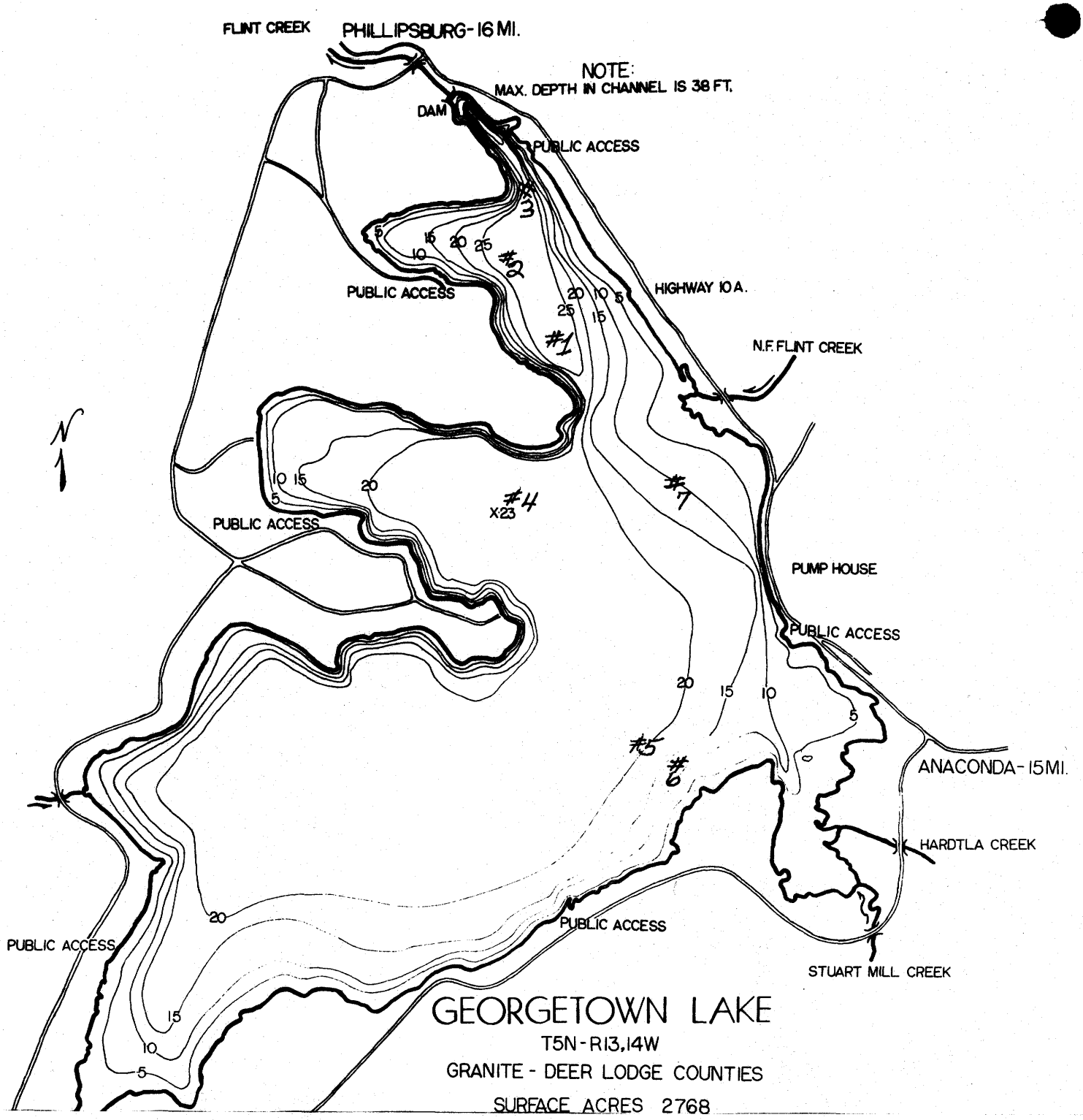

Figure 3. Georgetown Lake winter dissolved oxygen samplings stations, 1971 and 1972

Table 18. Georgetown Lake winter oxygen levels at several stations obtained during February and March, 1971 and 1972, respectively.

Date	Station No.	Maximum depth (feet)	Sampling depths below surface (feet)	Dissolved oxygen (ppm)
2/25-26,1971	1	28	26	0
			14	1
			3	12
	2	27	25	0
			13.5	2
			3	10
	3	27.5	25.5	0
			13.8	2
			3	10
	4	22	20	5
			3	14
	5	20	18	2
			3	15
	6	14	7	10
3/2-3,1972	1	26	24	0
			13	0.2
			3	6.0
	2	24	22	0
			12	1.0
			3	7.8
	3	18	16	0.2
			8	2.4
			3	8.0
	7	10	8	16
			3	7.2

Lower Twin - Special Survey

This survey was made to determine the size of the fish in the lake. This lake was planted with 6,000 fingerlings in 1968, 1969 and 1970. The average size of the fish is only 6.5 inches. The interval between fish plants will be increased with the hope that the reduction in competition will increase the average trout size.

Painted Rocks - Follow-up survey

This lake has been planted annually with catchable rainbow trout. Three gill nets were set overnight in Spring 1972 when the reservoir was drawn down for flood control. Cutthroat and Dolly Varden were the dominant gamefish in the catch. Four hatchery rainbow were taken and appeared in poor condition. No fish were identified as rainbow x cutthroat hybrids. This lake suffers considerable annual drawdowns. It is recommended that this fishery be managed to the extent possible on natural reproduction, and planting, if necessary, be with cutthroat trout.

Placid - Special survey

Game fish were 23 percent of the total net catch with brook trout and whitefish the dominant species. Pumpkinseed and squawfish were the most abundant non-game species.

Rainy Lake - Follow-up survey

This survey was made to determine the extent of repopulation of non-game species since 1965 when the lake was rehabilitated. In 1968, two yellow perch were taken by netting. Yellow perch were not captured during 1971 netting. Dolly Varden and cutthroat remained the only game-fish species. Four to six inch grayling introduced during 1970 were not captured. Additional sampling will be necessary to evaluate this introduction.

Salmon Lake - Follow-up survey

Planting of subcatchable rainbow trout was discontinued in 1968. Salmon Lake was surveyed to determine which trout species were present. Brown trout and Dolly Varden were the only trout species captured. The non-game fish species dominated the catch. Consideration should be given to resume the planting of subcatchable rainbow trout.

Shadow Lake - Special survey

This lake in the Moose Creek drainage was surveyed to provide information on the fisheries resource to aid Forest Service planners. This shallow lake was planted in 1969; however, there were no trout observed in 1971. It was recommended that planting be discontinued in this lake.

Snow Lake - Special survey

This lake in the Moose Creek drainage was also surveyed following a request by the Forest Service to evaluate the fisheries resource. No fish were captured in two gill nets. Planting with fingerlings on a multiple-year schedule is possible for this lake.

Spud Lake - Special survey

This is another lake found in the Moose Creek drainage and requested surveyed by the U. S. Forest Service. It has a self-sustaining cutthroat trout population averaging 9.3 inches in length.

Stewart Lake - Special survey

Public interest in this lake initiated this survey. Two net sets captured 13 rainbow ranging in size from 9.7-11.2 inches. Planting was on a three-year schedule but due to the easy access and heavy fishing use is now recommended for alternate year plants.

Unnamed Lake T3N R17W S5&6

This lake in the Moose Creek drainage was requested for survey by the Forest Service. A scuba survey found no fish present. The lake is shallow and no management recommendations were made.

Upper Twin - Special Survey

Due to public interest in this lake, two gill nets were set during the summer of 1971. Rainbow and rainbow-cutthroat hybrids were captured. This lake has a self-sustaining population. It is recommended it be managed without stocking.

Upsata - Follow-up survey

This lake is planted annually with approximately 10,000 rainbow fingerlings. The rainbow captured in the nets averaged 11.9 inches. The current planting schedule is recommended.

RECOMMENDATIONS

It is recommended that more intensive fish population information be gathered on select sections on Rock Creek. Coinciding with this work, emphasis should be placed on determining fisherman use and harvest on this blue-ribbon trout stream as the last census work occurred in 1967. Rock Creek has been a focal point for environmental groups concerned with preservation of this stream's values.

Surveillance of the fish populations below the Anaconda Company settling ponds should occur on a biannual basis to evaluate the effects of a closed-system operation being put into effect by the Anaconda Company.

Fish population estimates should be made on major streams such as Ninemile, Fish Creek, East Fork of the Bitterroot, Flint Creek, and others to provide us with base information on conditions as they exist now for comparisons in future years. Additional surveillance on lakes and streams should occur as the need arises.

LITERATURE CITED

Marcoux, R. G. 1970. Inventory of Waters of the Project Area. Job Progress Report, Federal Aid in Fish and Wildlife Restoration Acts. Montana Proj. No. F-12-R-17, Job Ia, 7 pp.

Michigan Institute for Fisheries Research. 1960. Population estimates by mark-and-recapture (Petersen Method) with confidence limits. Methods Memo No. 18:1-6.

Ricker, W. E. 1958. Handbook of computations for biological statistics of fish populations. Fish. Res. Bd. Can., Bull. 119, 300 p.

Spence, L. February, 1970. Inventory of Waters of the Project Area. Job Progress Report, Federal Aid in Fish and Wildlife Restoration Acts. Montana Proj. No. F-12-R-15, Job No. I, pp. 22.

Spence, L. November, 1970. Inventory of Waters of the Project Area. Job Progress Report, Federal Aid in Fish and Wildlife Restoration Acts. Montana Proj. No. F-12-R-16, Job No. I-a, pp. 13.

Prepared by Ronald G. Marcoux

Date March 8, 1973

Waters referred to:

Lakes	Streams
2-04612003	2-06003801
2-06900603	2-06723901
2-04621003	2-06114001
2-04630003	2-06112101
2-03785003	2-05145601
2-06796105	2-04147001
2-04660003	2-06169101
2-04672003	2-06526301
2-03840003	2-06703001
2-03947503	
2-03875005	
2-04714003	
2-04717003	
2-04723003	
2-03895020	
2-03910020	
2-03925003	
2-06925303	
2-03955020	
2-04756003	